

REMARKS

Claims 1, 11, 16, 20, 25 and 28 have been amended to clarify the subject matter. For example, claim 1 has been amended to recite “without requiring further knowledge of said file system.” Support for such an amendment can be found, for example, in claim 16 of the present application. No new matter has been added. Claims 1-3, 6-9 and 11-32 are pending.

In view of the above amendments and following remarks, the applicant respectfully requests withdrawal of each of the rejections and allowance of the application.

Claim Rejections – 35 USC § 103

Claims 1-2 and 11-12 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 5,950,203 (“the Stakuis patent”) and in further view of US Patent 5,64,972 (“the Crouse patent”). The Examiner acknowledges that the Stakuis patent fails to include the step of reading a formal description of the file system by said client from said disc storage device, wherein said client can read and write data to and from said disc storage device without requiring further knowledge of said file system. However, the Examiner argues that the Crouse patent discloses this feature and that a person skilled in the art would have been motivated to modify Stakuis’ system to allow reading a “formal description” to allow storage and retrieval of large volumes of data across multiple types of secondary storage. Applicants have amended claim 1 (and 11) to clarify the subject matter. These amendments are based on current claims and the specification.

Amended claim 1 recites:

1. (Currently Amended) A method for use in a file system including at least one server and one disc storage device for access by at least one client, said method comprising the steps of:
 - a. attaching said client to said file system; and
 - b. **reading a formal description of the file system by said client from said disc storage device, wherein said client determines file information from the formal description of the file system to directly to directly read and write data to and from said disc storage device without requiring further knowledge of said file system. (Emphasis added)**

We submit that the Crouse patent does not teach or suggest the above bolded features for at least the following reasons.

In particular, Crouse does not teach or suggest a technique for a client to determine file information from the formal description of the file system and to “**directly** read and write data to and from said disc storage device **without** requiring further knowledge of said file system” as recited in claim 1. Rather Crouse discloses an archiving file system (AFS) server (a remote file server) which runs on a file server, and at least two file systems: one on the server's discs and one on the server's backup tapes. The AFS server maintains control information on disc that describes the location of files stored on tape. With AFS, a remote computer needs to contact the server for access to files, and the server acts as a proxy for the remote computer, similar to the way conventional network file system (NFS) and CIFS operate. In other words, a remote computer is required to send a read request to the server, the server reads the data from the file system, and then sends the data back to the remote computer. Similarly, the client sends data to be written to the server, the server writes the data to the file on behalf of the remote computer, and then returns the result status to the remote computer. In no case does the remote computer access the storage “**directly**” as recited in claim 1.

In the Crouse patent, a file request generated by a client is channeled and processed by the server 14 because it contains the file control program 40 that controls access to the files in the devices 46, 48. Indeed, the Crouse patent found it necessary to provide a structure and program to control the devices 46, 48 used for storing files on a server. As a result, the server must process a request from a client in the Crouse structure, whereas in the current application, a client reads a “formal description of a file system” and “determines file information from the formal description” so that the client can “directly” access a storage means “without requiring further knowledge of the file system” as recited in claim 1. In other words, in the Crouse system, a remote computer may “indirectly” access files by making file requests to intervening systems and computers that provide additional information about the file, but does **not** allow a client to “**directly** read and write data to and from said disc storage device **without** requiring further knowledge of said file system” as recited in claim 1.

Moreover, Crouse does not teach or suggest reading a formal description of the file system by said client “**from** said disc storage device” as recited in claim 1. In the Crouse patent,

there is no formal description of what is stored on tape. Although the Crouse patent provides meta-data to describe the contents of the tape so that the server can find files faster than if it had to search the entire tape, such meta-data is not equivalent to a formal description as recited in claim 1. This may be important for performance, because tape is a sequential access device, whereas discs are randomly accessed. The meta-data describing the tape contents is called a "resource file" in the patent. There is nothing in the Crouse patent that would allow a remote computer to teach itself about the format of the file system stored on tape, even if it had access to the tape drive. In other words, in the Crouse patent, information about the tape files is maintained on the server computer requiring the remote computer to obtain file information from the server, whereas, in the present invention, a client is capable of reading a formal description of the file system by said client "from said disc storage device" and "determine file information from the formal description of the file system" as recited in claim 1.

In addition, we submit that the Crouse patent does not teach or suggest "a formal description of the file system" as recited in claim 1. Rather, as recognized by the Examiner, the Crouse patent discloses an archiving file system that uses a "flexible control structure that is used for storing control information about the remote files as part of an addressable control file that has space on the data server." (See column 4, lines 45-53; FIG. 12) Referring to FIG. 2 of the Crouse patent, a file control program (40) controls devices (46, 48) and both the program and the devices are coupled together on a server 14. The program 40 handles file requests normally made by the OS 20, thus there may be no need to the modify the standard file system program 24 stored at user node 10 on the network. (See column 8, lines 26-42) Although the techniques show a control structure and corresponding program that may manage the storage of and access to remote files, these techniques do not teach or suggest "reading a formal description of the file system by said client from said disc storage device, wherein said client determines file information from the formal description of the file system to directly read and write data to and from said disc storage device without requiring further knowledge of said file system" as recited in claim 1.

The techniques of the Crouse patent are directed to a file structure for use in an archiving file system that is fixed or tightly coupled to a server. For example, in the Crouse patent, the information and file structure are directed to files related to an archiving file system and contains

information related to archiving files (e.g. hierarchically selected archival file attributes and an archival block pointer). In fact, in the Crouse patent, a "standard file control program" (as shown in FIG. 1, labeled prior art) was replaced with an "archiving file system (AFS) control program" (as shown in FIG. 2) to handle functions related to archiving. The techniques of the Crouse patent indicate that it created a new file structure and control program fixed to a server to handle archiving functions without mentioning any mechanism for transferring such structure to a client over a network.

We submit, therefore, that neither the Stakuis patent nor the Crouse patent describe or suggest the invention recited in claim 1. Nor do the references disclose systems that provide the advantages of the claimed invention. For example, in one embodiment, a client reads a formal description of a file system directly from the disk (step 3) and saves this description for use in the future. (See page 12, lines 2-4 of the application; FIG. 5) For example, when a read request (step 4) or a write request (step 5) occurs, the client uses the formal description to interpret the file system and to read/write data directly to the disk. (See page 12, lines 4-6 of the application) These techniques may provide various advantages, such as, permitting file system utility programs to be made independent of the file system type by using the file system's formal description. (See page 13, line 9 to page 14, line 10 of the application)

Moreover, the Stakuis patent, as mentioned below, fails to teach or suggest a "description of a file system" or providing a client with the ability to acquire such a description from the storage device as recited in claim 16. (See 35 U.S.C. § 102 rejection below) In view of the above remarks, it would not have been obvious to one skilled in the art to modify the teachings of Stakuis to derive the claimed invention.

Thus, the cited references, alone or in combination, fail to teach or suggest the invention as recited in claim 1. Thus, the applicant respectfully requests withdrawal of the 35 U.S.C. § 103(a) rejections of claim 1 and dependent claim 2.

Claim 11 has been amended to recite a system that includes a client configured to perform the method of claim 1. For the reasons explained above, claim 1 is distinct from the prior art. Thus, the applicant respectfully requests withdrawal of the 35 U.S.C. § 103(a) rejections of claim 11 as well as dependent claim 12.

Claims 3, 6-9 and 13-15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Stakuis patent in view of the Crouse patent as applied to claims 1, 11 and 2, 12, and further in view Bach. As explained above, claim 1 and 11 is distinct from the prior art references. Thus, dependent claims 3, 6-9 and 13-15 should be allowable for at least the same reasons.

In light of the above remarks, the applicant respectfully requests withdrawal of the 35 U.S.C. §103(a) rejections of claims 1-2, 6-9, 11-12 and 13-15.

Claim Rejections – 35 USC § 102

Claims 16-32 have been rejected under 35 U.S.C. §102(a) as being allegedly anticipated by US Patent 5,950,203 ("the Stakuis patent").

Claim 16 (and) have been amended to clarify the subject matter.

Amended claim 16 recites:

16. (Currently Amended) A method for reading or writing data from a storage source comprising:
acquiring a description of a **file system associated with a storage resource from the storage resource**; and
determining file information from the description of a file system for reading or writing directly to the storage resource based on the description **without requiring further knowledge of said storage resource**. (Emphasis Added)

We submit that the above bolded features are not taught or suggested by the cited prior art references for at least the following reasons.

In particular, the Stakutis patent may maintain administrative information about files but its does not provide for "determining file information from the description of a file system" for reading or writing directly to the storage resource as recited in claim 16. Rather, in the Stakuis patent, administrative information doesn't "teach" the client system how to interpret the file system format. First, the information (block mappings) are stored on the client system for performance (they are cached there while the file is in use). They are not created by the client. Rather, the client requests that the server return a mapping for a particular file and the client stores this mapping for future use. The entity that interprets the file system format is the server, not the client. The client only has a list of blocks that constitute a particular file.

In the current application, the client reads the "description of the file system" so that it can "determine file information to access data on the storage resource as recited in claim 1. In other words, the client interprets file system data structures as well as file data structures based on the formal description of the file system. In contrast, the remote computers in the Stakuis patent merely read the blocks that the server directs it to read. It is important to note the distinction between file structure *and* file system structure. A file system is a collection of files and their associated meta-data that allow the storage to be managed. The Stakuis patent doesn't address "file system" structures. It only addresses "file" structures, and in that, it only does so to a limited extent. It deals with block lists and nothing else (such as file attributes). Thus, in the Stakuis patent, the term "file map" pertains to an individual file and is limited to the blocks constituting the file's user data.

Moreover, the Stakutis patent fails to teach a client that "reads a formal description of a file system" directly from the disk and the client uses the description to determine the file system to read/write data directly to the disk as recited in claim 16.

The Stakuis patent discloses a method that includes a bypass mechanism which executes on a first node and the mechanism intercedes in response to at least selected input/output, or access, requests generated by that node. (See FIG. 1 and column 2, lines 43-45) The bypass mechanism allows data to be transferred between the first node and the peripheral device over a third communications path. (See column 2, lines 45-50) Such transfers are made using administrative information maintained by the file system relating to the storage of such data on the peripheral data. (See column 2, lines 50-52) However, the administrative information includes file mappings governing the physical location at which the data is stored on the peripheral device and are obtained from the second node. (See column 2, lines 59-61) The first node acquires the administrative information by applying further requests to the server. For example, the first node issues two requests: a first request causes the information to be retrieved into an actual or virtual ("ghost") file local to the second node, and a second request by the first node causes the information to be transferred over the network to the first node. (See column 2, lines 67 to column 3, line 4)

Such administrative information is **not** equivalent to "a description of a file system associated with a storage resource" as recited on claim 16. In the current invention, the

description of the file system provides more than just information related to each file. For example, the description of a file system as recited in claim 16 does not require the client to change as the file system format changes, because the formal description that is stored in the disk will change as the file system changes. (See page 11, lines 21-23 of the application) The description of the file system also allows the client to access data from the disc resource without further knowledge of the file system. (See claim 1 of the present invention) As a result, system performance may be improved. In contrast, the information mentioned in the Stakuis patent relates to file mappings and **not** "a description of a file system associated with a storage resource" as recited on claim 16.

In the Stakuis patent, the information associated with each file is read from the server requiring the first node to issue at least two requests to acquire such information. (See column 3, lines 1-3) As a result, the techniques of the Stakuis patent require the client node to issue additional requests for each file reducing system performance, whereas, in the present invention system performance is improved because the first node acquires the description of the file system without requiring additional requests from the server. Thus, in the Stakuis patent, the first node acquires information associated with file mappings of **an individual file** requested by the first node and not a **description of a file system** associated with a storage resource as recited in claim 16. The applicant respectfully asserts that the cited references fail to teach or suggest "acquiring a description of a file system associated with a storage resource, and reading or writing directly to the storage resource based on the description" as recited in claim 16.

It should be noted that such information is not a representation of a "file system". The formal description contains enough information to teach the client how to interpret the on-disc data structures. In the absence of this formal description, the client must be hard-coded to understand a particular file system format, and this must match the format as maintained by the server. The Stakuis patent relies on the server hard-coding knowledge of the file system format and doesn't allow the remote computer to interpret this format at all, so the remote computer only knows about disk blocks, not file system structures. The consequence of this is that the Stakuis patent relies on the server to make all changes to the file system that are not related to user data. In other words, the Stakuis patent only allows the blocks to be read and written by the client if the blocks constitute the file to be read or written. Information like file size, file owner and

permissions, and file modification time can only be written by the server, because the client doesn't know how this information is stored on disk. In the current application, the client is capable of understanding how these attributes are stored and, with the proper locking, the client can update these itself, without intervention by the server.

In addition, the techniques of the Stakuis patent fail to teach or suggest reading or writing **“directly to the storage resource based on the description without requiring further knowledge of said file system”** as recited in claim 16, because Stakuis requires participation of the server to interpret the file system format. For example, in the Stakuis patent, the server intercepts a request for a file from a client and sends the client a file mapping which the client stores for later read/write operations. (See column 10, lines 9-23) Then a client filter driver 66 intercepts a read request to determine if the read request is directed to a file for which mapping information is available. (See column 10, lines 25-49) That is, the Stakuis patent provides a file mapping that requires additional information and process steps to fulfill read/write requests. In contrast, the client in the present invention reads the description of the file system from the disk directly and then uses the description to read/write data directly from/to the disk. (See page 12, lines 1-6 of the application). Thus, the Stakuis patent fails to teach or suggest “reading or writing directly to the storage resource based on the description without requiring further knowledge of said file system” as recited in claim 16.

Thus, claim 16 is not anticipated by the cited reference. Since claims 17-19 depend directly or indirectly on claim 16, they should be allowable for at least the same reasons

Claim 20 has been amended to recite an apparatus configured to perform the method of claim 16. As explained above, claim 16 is distinct from the prior art. In view of the above remarks, the applicants respectfully request withdrawal of the 35 U.S.C. § 102(a) rejections of claim 20 as well as dependent claims 21-24.

Likewise, claim 25 has been amended to recite an article that includes instructions for performing the method of claim 16. As explained above, claim 16 is distinct from the prior art. In view of the above remarks, the applicants respectfully request withdrawal of the 35 U.S.C. § 102(a) rejections of claim 25 as well as dependent claims 26-27.

Similarly, claim 28 has been amended to recite a system that includes a client configured to perform the method of claim 16. As explained above, claim 16 is distinct from the prior art.

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In view of the above remarks, the applicants respectfully request withdrawal of the 35 U.S.C. § 102(a) rejections of claim 28 as well as dependent claims 29-32.

In light of the above remarks, the applicant respectfully requests withdrawal of the 35 U.S.C. §102(a) rejections of claims 16-32.